



The 2013 Southwest Coastal Louisiana Draft Integrated Feasibility Report and Programmatic Impact Statement (“2013 Initial Draft Report”) identified a Tentatively Selected Plan (TSP) for the National Economic Development (NED) and the National Ecosystem Restoration (NER) aspects of the study. In March 2015, a Revised Integrated Draft Feasibility Report and Environmental Impact Statement (“2015 Revised Draft Report”) was released with updated NED and NER TSPs that differed from those identified in 2013. This Report (“2016 Final Report”) updates and finalizes the 2015 Revised Draft Report (which concluded its public review in May 2015). This report contains the Recommended Plan (RP) for the NED and the NER components of the Study.

The people, economy, environment, and cultural heritage of coastal areas in Southwest Louisiana are at risk from damages caused by hurricane storm surge flooding. Southwest coastal Louisiana’s topography and low elevation, proximity to the Gulf of Mexico, subsiding lands, and rising seas, are all contributing factors which cause coastal flooding, shoreline erosion, saltwater intrusion, and loss of wetland and Chenier habitats which are conditions that are expected to continue to worsen.

Through separate authorizations, Congress authorized the investigation of alternatives to: (1) provide risk reduction from damages deriving from hurricane storm surge, and (2) significantly restore environmental conditions. Planning to address hurricane storm surge risk reduction (the NED component) was primarily focused on communities and areas located north of the Gulf Intracoastal Waterway (GIWW), but measures for all at-risk structures both inside and outside of the coastal zone were considered. Planning measures for ecosystem restoration (the NER component) concentrated exclusively on locations within the coastal zone.

The Southwest Coastal Louisiana study area encompasses over 4,700 square miles of varying terrain in Calcasieu, Cameron, and Vermilion Parishes. The major physiographic divisions are the Gulf Coast Prairie and the Gulf Coast Marsh. The major hydrologic basins in the Study Area are the Mermentau River, the Calcasieu-Sabine Lakes, and the Teche/Vermilion Basin. Dominant water features in the Study Area are the Calcasieu, Sabine, Neches, Mermentau, and Vermilion Rivers and Calcasieu, Sabine, Grand, and White Lakes. Man-made channels in the Study Area are the Sabine-Neches Waterway, Calcasieu Ship Channel, GIWW, Mermentau Ship Channel, and Freshwater Bayou Canal. The channels and waterways, except for the GIWW, are oriented north to south along the Gulf coast.

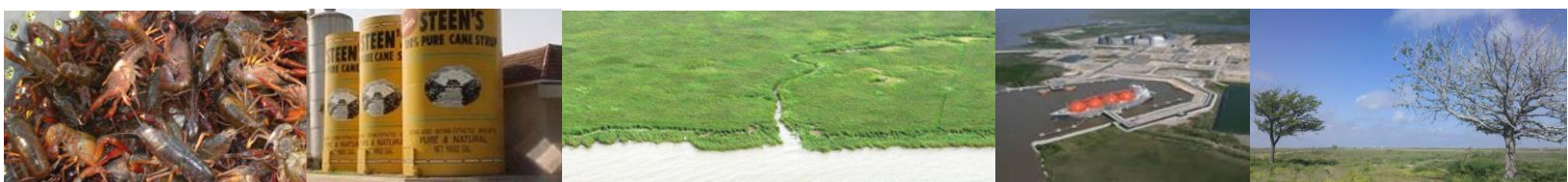
The GIWW is the longest channel crossing the Study Area and generally runs along the State’s coastal zone boundary. Water control structures in the Study Area are the Calcasieu and Leland Bowman Locks, the Freshwater Bayou Canal Lock, the Schooner Bayou Canal Structure, and the Catfish Point Control Structure. Key highways in the Study Area are LA-82, LA-27, and I-10. Population centers are mainly north of the GIWW, and the largest include the municipalities of Lake Charles, Sulphur, and Abbeville.

The Project Delivery Team (PDT) used information from prior Federal, state, and local efforts to focus the Study on the most critical areas. System-wide problems and opportunities were used to identify and define site-specific problems and opportunities. Problems in the SWC Study Area include:

- Flooding from tidal surge and waves associated with hurricanes and tropical storms.
- Increased flood durations in wetlands, resulting in wetland loss.
- Erosion of channel banks and shorelines, resulting in wetland loss.
- Deforestation and mining of chenier ridges.

Opportunities to solve these problems include:

- Incorporate structural and nonstructural hurricane storm damage risk reduction measures to reduce the risk of damages and prevent loss of community cohesion.
- Improve internal system hydrology to restore wetlands.
- Manage salinity levels to maintain fresh and intermediate marsh.
- Reduce bank and shoreline erosion.





- Prevent loss of significant cultural and historic resources.

The PDT developed the following five planning objectives to apply to the entire study area for the 50-year period of analysis (2025-2075):

- *Objective 1.* Reduce the risk of damages and losses from hurricane storm surge flooding.
- *Objective 2.* Manage tidal flows to improve drainage and prevent salinity from exceeding 2 parts per thousand (ppt) for fresh marsh and 6 ppt for intermediate marsh.
- *Objective 3.* Increase wetland productivity in fresh and intermediate marshes to maintain function by reducing the time water levels exceed marsh surfaces.
- *Objective 4.* Reduce shoreline erosion and stabilize canal banks to protect adjacent wetlands.
- *Objective 5.* Restore landscapes, including marsh, shoreline, and cheniers to maintain their function as wildlife habitat and improve their ability to serve as protective barriers.

The following planning constraints to be avoided or minimized were identified:

- *Commercial navigation.* The Calcasieu and Sabine ship channels and the GIWW carry significant navigation traffic. Therefore, features that might result in shipping delays or undermine the purposes of authorized navigation projects would likely result in negative NED impacts.
- *Federally listed threatened and endangered species and their critical habitats.* Construction windows for resident and migratory species overlap and/or may include the entire year: piping plover, Gulf sturgeon, red-cockaded woodpecker, rufa subspecies of red knot, whooping crane, West Indian manatee, and several species of sea turtles.
- *Essential fish habitat (EFH), especially intertidal wetlands.* Conversion of one EFH type to another should be done without adversely impacting various fish species. For example, conversion of shallow open water EFH to marsh EFH.
- *Cultural and historic resources.* Prehistoric and historic archeological sites, buildings, structures, and properties that may be of religious and cultural significance to Indian tribes are located in the study area, including properties included in or eligible for inclusion in the National Register of Historic Places, although the majority of cultural and historic resources have not been assessed for eligibility.

National Economic Development (NED) Planning

Hurricane storm damage risk reduction measures were developed and screened using preliminary costs and benefits to identify a focused array of NED alternatives. In addition to the “No Action” alternative, the focused array contained three levee alignments in the Lake Charles area; three levee alignments around the towns of Abbeville, Delcambre, and/or Erath; and two stand-alone nonstructural alternatives.

NED Focused Array includes:

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| • No Action | • Delcambre/Erath |
| • Lake Charles Eastbank | • Abbeville to Delcambre |
| • Lake Charles Westbank Sulphur Extended | • Abbeville |
| • Lake Charles Westbank Sulphur South | • Nonstructural Justified Reaches Plan |
| • 100-Year Floodplain [1% Annual Chance Exceedance (ACE)] Nonstructural Plan | |

The assessment of economic feasibility for six independent structural measures was conducted in the focused array analysis. As a result of this additional evaluation, none of the structural levee alignments were found to be economically justified and none were carried into the final array. The evaluation of the focused array determined that the most cost-effective solution to reduce hurricane storm surge risk within the study area is through nonstructural measures. The No Action Plan, Plan 7 “Nonstructural - Justified Reaches Plan” (based on 11 economically justified reaches) and Plan 8 “100-Year Floodplain Plan” were carried into the final array with Plan 7 being selected as the NED TSP in the 2013 Initial Draft Report.



After its release for public review and the receipt of comments on the 2013 Initial Draft Report, structures in the 0-10-year floodplain were added to the structure inventory and additional economic calculations were performed to determine net NED benefits and a new benefit/cost ratio (BCR). That effort led to release of the 2015 Revised Draft Report which identified a new TSP based on these results. Further analysis after the release of the 2015 Revised Draft Report, resulted in refinements to the TSP, the results of which are presented here as the NED RP in this 2016 Final Report. These revisions resulted from the evaluation of every structure in the updated inventory with a First Floor Elevation (FFE) below the 100-year stage for water surface elevations prevailing in the year 2025 rather than the year 2075. Now, the final NED RP would provide hurricane storm surge risk reduction for all structures in the study area with a FFE at or below the 25-year stage based on predicted year 2025 hydrologic conditions. The RP reduces the risk of hurricane storm surge damage for a total of 3,961 structures. The RP is 100% voluntary in nature and is comprised of 3,462 residential structures, 342 commercial structures and public buildings, and 157 warehouses. The equivalent annual net benefits are approximated at \$167.5 million dollars, with ~\$906 million in first costs, and a BCR of 5.65:1.

A brief summary of the components of the NED RP includes:

1. Elevation of eligible residential structures. This measure requires lifting the entire structure or the habitable area to the predicted 2075, 100-year base flood elevation unless the required elevation is greater than a maximum of 13 feet above ground level (structures requiring elevation greater than 13 feet above ground level would be ineligible to participate due to engineering and risk related factors).
2. Dry flood proofing of eligible non-residential structures (excluding large warehouses). Dry flood proofing consists of sealing all areas below the hurricane storm surge risk reduction level of a structure to make it watertight and to ensure that floodwaters cannot get inside by making walls, doors, windows, and other openings resistant to water penetration.
3. Construction of localized storm surge risk reduction measures less than 6 feet in height around non-residential warehouse structures. These measures are intended to reduce the frequency of flooding from hurricane storm surge, but not to eliminate floodplain management and flood insurance requirements.

NED Implementation Strategy

This Final Report recommends a strategy to implement the nonstructural project for eligible structures. Structures that have been identified as preliminarily eligible as part of the RP are located across the 4,700 mile, three-parish study area. In order to effectively implement the RP, clusters of eligible structures that represent the highest risk for hurricane storm surge damages (i.e. those with a FFE below the 10-year stage) would be identified and prioritized for construction. Individual structures would be addressed based on a ranking of risk from highest to lowest within the cluster. The ranking of individual structures would be revisited as elevation work is completed, as additional funding is distributed, and as new clusters are identified. Addressing multiple groups of structures within a small geographic area would be more cost-effective, efficient, and would also allow for a more strategic methodology for applying nonstructural measures to at-risk structures. More details on this process can be found in Appendix L.

National Ecosystem Restoration (NER) Planning

NER plan screening was based on monetary and non-monetary evaluations. Preliminary costs and benefits for marsh restoration, shoreline protection, chenier reforestation, oyster reef preservation, and water control features were estimated. Screening criteria included planning constraints; support for objectives; measure effectiveness; and efficiency. Measures that did not meet the screening criteria were retained only in limited instances in which they supported critical adjacent features.

Alternative plans were created by combining measure types into comprehensive strategies. The measures include hydrologic and salinity control, marsh restoration, shoreline protection, and chenier reforestation. The NER focused array contains a “No Action” alternative and 27 other plans that were based on 8 restoration strategies.

NER Strategies:

- No Action
- Large Integrated Restoration
- Moderate Integrated Restoration (Hydrologic Emphasis)
- Moderate Integrated Restoration, including Gum Cove Lock
- Small Integrated Restoration
- Interior Perimeter Salinity Control
- Marsh and Shoreline (Minimal Hydrologic & Salinity Control)
- Entry Salinity Control

Scales and combinations of these strategies were developed resulting in 28 NER alternatives in the focused array. Benefits in the Calcasieu-Sabine Basin were considered separately from the Mermentau/Teche-Vermilion Basin. Benefits were also considered jointly as comprehensive plans (covering both basins). Alternatives were evaluated for cost effectiveness and incremental costs.

The NER RP is “Small Integrated Restoration”, also known as NER Plan CM-4, which consists of 49 ecosystem restoration features recommended for construction (9 marsh restoration features; 35 chenier reforestation features; and 5 shoreline protection features). The Federal NER RP is the least-cost, cost-effective, comprehensive ecosystem restoration plan that addresses land loss and ecosystem degradation. The Federal NER RP contains features to restore 15,448 acres of wetlands; restore and protect 335 acres of designated critical habitat (for threatened piping plover and red knot); enhance plant productivity; and reinforce and protect critical landscape features. The Calcasieu Ship Channel Salinity Barrier and the Cameron-Creole Watershed Spillway are recommended as additional long-range studies. Two marsh restoration features, located partially on U.S. Fish and Wildlife Service (USFWS) refuge lands are included as part of the Federal NER RP [Feature 124d Marsh Restoration at Mud Lake (Sabine National Wildlife Refuge)] and Feature 3c1 Beneficial Use of Dredged Material from Calcasieu Ship Channel (Cameron Prairie National Wildlife Refuge). These two features make up an important and integral component of the overall restoration plan. Because USFWS is ultimately responsible for managing its refuge lands, USACE is not seeking authorization and funding for these two features. Rather, USACE supports USFWS in seeking its own authorization and appropriation to construct these features and offers USFWS the information that USACE developed under this study effort as a starting point for those efforts. The Federal NER RP project first cost estimate (which includes costs associated with these two features) is \$2.49 billion. Of that cost, the USACE estimates approximately \$297 million for the design, construction, and construction management costs of these two features. However, it is anticipated that USFWS would develop its own costs in connection with these features. The total ecosystem benefits associated with the two USFWS features are 1,492 acres and 611 average annual habitat units. The remainder of the NER RP benefits and costs, less those attributed to the USFWS features, represents the Corps NER RP.

NER Implementation Strategy

The Corps NER RP includes a three tiered implementation sequence. (1) Tier I features may be constructed simultaneously because they would not affect the construction of any nearby Tier I NER Recommended Plan feature. Shoreline protection features would be constructed prior to marsh restoration features in an effort to better protect the more storm-vulnerable marsh restoration features. This approach contributes to the sustainability of the marsh restoration features. The project first cost for Tier 1 is \$850,998,000 producing 1,930 AAHU. (2) Tier II NER Recommended Plan features were so categorized because they utilize the same borrow or staging area, and/or construction of these features would potentially interfere with construction of a Tier I NER Recommended Plan feature. The project first cost for Tier II is \$561,186,000 producing 1,117 AAHU. (3) Tier III NER Recommended Plan features were so categorized because they would utilize the same borrow or staging area, and/or interfered with construction of a Tier II feature, and/or interfered with an existing mitigation project. The project first cost for Tier III is \$776,002,000 producing 1,318 AAHU.



Risk and Uncertainty

In accordance with USACE Sea Level Change Guidance, ER 1100-2-8162, the study evaluated potential impacts of sea level change in formulating and engineering the recommended plans. The risk reduction system and ecosystem restoration features being proposed are based on the intermediate relative sea level rise projection. However, the Corps will continue to monitor local conditions and determine if the intermediate scenario of RSLR is occurring. If observed conditions deviate from intermediate to high sea level forecasts during design or construction, reevaluation of the NED and NER will be required.

The NED/NER RPs, and their integrated performance allow the direct management of the greatest identified risks and extend the performance and effectiveness of local hazard mitigation actions, as well as increase valuable ecosystem outputs. The NER RP tiered implementation assures that features will be implemented in a manner that will address the most potentially far reaching impacts. These impacts also represent the most likely threat to existing critical landscape features. The interface between the NER RP and these identified critical features produces additional resilience in the geomorphic structure and sustainability of the area and adds reliability in the ability of the landscape to support risk management. This in turn allows the NED RP features to perform in the most effective and efficient manner for the greatest possible duration.

Areas of Controversy

1. The single-most important area of controversy focused on the 2015 Revised Draft Report TSP that included the mandatory removal of structures identified as being at high-risk of coastal flooding. This aspect of the NED TSP generated over several hundred oral and written comments and signatures on a petition to “PLEASE TAKE IT OUT!”; to completely remove any and all references or language to ‘eminent domain’ and ‘mandatory/involuntary participation’ from the study. The property owner’s choice to remain at their ‘own risk’ or possibly without future assistance is considered the only appropriate course of action. Furthermore, the statement has been made that the goal of the plan was to restore and protect the coast and marshes, and assist in preserving the unique cultural heritage of Southwest Louisiana, not forcibly remove people from their homes and family lands.
2. Over 2,540 signatures on a petition and several oral and written comments requested that reforestation measures be replaced by shoreline protection measures. As stated in the petition: “Shoreline protection would be a better investment for our coast’s future.”
3. The petition requests that a ‘local sponsor’ be chosen to have an immediate ‘voice’ in the remaining planning process of the study. The petition states that local sponsors can assist in making valid and important corrections and local concerns could be immediately addressed.
4. Over 2,540 signatures on a petition and several oral and written comments stated that “our parish deserves ‘protection.’” The report should include Parish Priority Restoration Projects and insert a list of all of the measures and projects proposed in the parishes’ existing and proposed Coastal Restoration & Protection Plans. The stated purpose of this request is that the inclusion of all such measures and projects will eliminate the unintentional exclusion of projects that were not selected and will clearly indicate the worthiness for future consideration for funding.
5. Controversy over the perceived insufficient number of ecosystem restoration projects throughout the study area. The large study area has numerous areas in need of ecosystem restoration. However, the PDT took an approach to address those areas in greatest need of restoration. The public demands more acres of restoration to this area due to the rapid land loss being experienced.
6. Controversy over insufficient number of hydrologic/salinity control measures identified in the NER TSP, as well as controversy over recommending hydrologic/salinity control measures for future study instead of providing such measures for immediate construction.



7. Controversy over the lack of salinity and flood control measures to prevent the Calcasieu River from flooding areas upstream during storm surge events.
8. The 2013 Initial Draft Report primary area of controversy was public demand for design and implementation of structural risk reduction measures (e.g., levees), not non-structural measures.

More information about the Areas of Controversy as well as a section on Issues to be Resolved can be found in Chapter 4, which describes the Final RP.